



U.S. Department of Energy
Technical Qualification Program

Industrial Hygiene Topical Area

Study Guide

Developed by the
Ohio Field Office
and the
*DOE/EH Office of Technical Training
and Professional Development (EH-74)*

November 1996

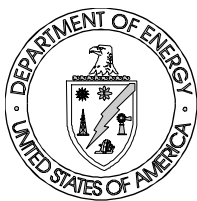


Table of Contents

Contents

	Page
Introduction	viii
1. Scope	viii
2. Purpose	viii
3. References	ix
4. DOE Orders in Transition	xi
5. Internet Sites	xii
6. How to Use This Study Guide	xiii

Industrial Hygiene Competencies

Competency 1.1	IH 1.1-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to anticipate and recognize health stressors during the review of facility plans, designs, and operations prior to their implementation.

Competency 1.2	IH 1.2-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of study and observation methods used to identify and evaluate potential work place stressors.

Competency 1.3	IH 1.3-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of investigative techniques used to recognize exposures to health stressors which may be found in complaint reports and/or signs and symptoms of health decrement.

Competency 1.4	IH 1.4-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of how priorities are set by recording, organizing, and analyzing data.

Competency 1.5	IH 1.5-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of data collection plans used to collect environmental data which accurately reflects exposure conditions.



Table of Contents

Competency 1.6	IH 1.6-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of sampling techniques.

Competency 1.7	IH 1.7-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of sample analysis, including the use of appropriate laboratory techniques.

Competency 1.8	IH 1.8-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the analysis and interpretation of sample results.

Competency 1.9	IH 1.9-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the methods used to educate people about protecting themselves, others, and the environment from health and environmental stressors.

Competency 1.11	IH 1.11-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the design of engineering measures to control exposure.

Competency 1.12	IH 1.12-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the design of administrative measures to control exposure.

Competency 1.13	IH 1.13-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the methods used to communicate control action recommendations.

Competency 1.14	IH 1.14-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate the ability to verify the effectiveness of control measures and/or control system performance.

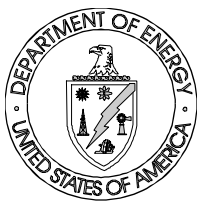


Table of Contents

Competency 1.15	IH 1.15-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate a working level knowledge of Industrial Hygiene programs.

Competency 1.16	IH 1.16-1
-----------------------	-----------

Industrial hygiene personnel shall demonstrate a working level knowledge of the standards of professional behavior required to maintain professional conduct consistent with published ethical guidelines for the profession.

Competency 2.1	IH 2.1-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to evaluate the adequacy of local compliance with the following document sections:

29 CFR 1910, Occupational Safety and Health Standards such as the following:

- 1910.20 - Access to Employee Exposure and Medical Records
- 1910.120 - Hazardous Waste Operations and Emergency Response
- 1910.146 - Permit-Required Confined Spaces
- Subpart G - Occupational Health and Emergency Response
- Subpart H - Hazardous Materials
- Subpart I - Personal Protective Equipment
- Subpart J - General Environmental Controls
- Subpart K - Medical and First Aid
- Subpart Q - Welding, Cutting, and Brazing
- Subpart Z - Hazardous Substances

29 CFR 1926, Safety and Health Standards such as the following:

- Subpart D - Occupational Health and Environmental Control
- Subpart E - Personal Protective and Life Saving Equipment
- Subpart H - Material Handling, Storage, Use, and Disposal
- Subpart J - Welding and Cutting
- Subpart Y - Record-keeping
- Appendices A&B to Subpart Y - Examples of conditions which may restrict or limit exposure to hyperbaric conditions and guidelines for scientific diving
- Subpart Z - Toxic and Hazardous Substances



Table of Contents

Industrial hygiene-related technical standards such as the following:

- **40 CFR 763 - Asbestos**
- **ANSI Z88.2 - Practices for Respiratory Protection**
- **ANSI Z88.6 - Respiratory Protection, Respirator Use, and Physical Qualifications for Personnel**
- **ANSI Z136.1 - Safe Use of Lasers**
- **ANSI Z117.1 - Safety Requirements for Working in Tanks and Other Confined Spaces**
- **ANSI Z358.1 - Emergency Eyewash and Shower Equipment**
- **ANSI C95.1 - Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100GHz**
- **ACGIH TLV Booklet - American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices**

Competency 2.2 IH 2.2-1

Industrial hygiene personnel shall demonstrate the ability to determine the adequacy of local compliance with the industrial hygiene-related sections and/or requirements of Department of Energy (DOE) Orders such as the following:

- **DOE Order 3790.1B, Federal Employee Occupational Safety and Health Program**
- **DOE Order 5000.3B, Occurrence Reporting and Processing of Operations Information**
- **DOE Order 5480.1B, Environment, Safety and Health Program for Department of Energy Operations**
- **DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards**
- **DOE Order 5480.8A, Contractor Occupational Medical Program**
- **DOE Order 5480.9A, Construction Project Safety and Health Management**
- **DOE Order 5480.10, Contractor Industrial Hygiene Program**
- **DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities**
- **DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities**
- **DOE Order 5480.22, Technical Safety Requirements**
- **DOE Order 5480.23, Nuclear Safety Analysis Reports**
- **DOE Order 5481.1B, Safety Analysis and Review System**
- **DOE Order 5482.1B, Environment, Safety, and Health Appraisal Program**
- **DOE Order 5483.1A, Occupational Safety and Health Program for DOE Contractor Employees at Government Owned Contractor Operated Facilities**
- **DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements**
- **DOE Order 5500.3A, Planning and Preparedness for Operational Emergencies**



Table of Contents

Competency 3.1	IH 3.1-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a familiarity level knowledge of industrial hygiene-related data management requirements.

Competency 3.2	IH 3.2-1
----------------------	----------

Industrial hygiene personnel shall demonstrate a familiarity level knowledge of the principle Departmental and external committees, agencies, and associations relating to the field of industrial hygiene.

Competency 4.3	IH 4.3-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to trend and analyze industrial hygiene-related information.

Competency 4.4	IH 4.4-1
----------------------	----------

Industrial hygiene personnel shall demonstrate an expert level knowledge of the requirements and process for determining the appropriateness of variance requests and equivalencies relating to Department of Energy prescribed industrial hygiene requirements or standards.

Competency 4.5	IH 4.5-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to apply recognized industrial hygiene evaluation criteria and methods to reduce the risk of occupational disease or illness.

Competency 4.8	IH 4.8-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to evaluate industrial hygiene training and personnel qualification programs.

Competency 4.9	IH 4.9-1
----------------------	----------

Industrial hygiene personnel shall demonstrate the ability to independently assess contractor and/or Department of Energy compliance with the industrial hygiene-related requirements contained in the following Orders with respect to occupational health protection issues:

- DOE Order 3790.1B, Federal Employee Occupational Safety and Health Program
- DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards
- DOE Order 5480.10, Contractor Industrial Hygiene Program
- DOE Order 5482.1B, Environment, Safety, and Health Appraisal Program

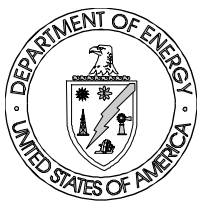


Table of Contents

Other Related Competencies

General Technical Base Competency 5.5 GT 5.5-1

Personnel shall demonstrate a knowledge of industrial hygiene principles.

Mechanical Systems Competency 2.19 MS 2.19-1

Mechanical systems personnel shall demonstrate a familiarity level knowledge of the codes and standards of the American Congress of Governmental Industrial Hygienists (ACGIH).

Scenarios

Scenario 1. S 1-1

This scenario supports the following competencies: IH 1.2, 1.3, 1.9, and GTB 5.5.

Scenario 2. S 2-1

This scenario supports the following competencies: IH 1.4, 1.9 - 1.12, 4.3, 4.5, and GTB 5.5.

Scenario 3. S 3-1

This scenario supports the following competency: IH 1.16.

Scenario 4. S 4-1

This scenario supports the following competencies: IH 1.1 - 1.3, 2.1, 4.5, and 4.8.

Scenario 5. S 5-1

This scenario supports the following competencies: IH 1.1, 1.2, 1.5 - 1.9, 4.3, and GTB 5.5.

Scenario 6. S 6-1

This scenario supports the following competencies: IH 1.5 - 1.8, 1.12, 1.14, and 1.15.

Scenario 7. S 7-1

This scenario supports the following competencies: IH 2.1 and 2.2.



Table of Contents

Scenario 8.	S 8-1
------------------	-------

This scenario supports the following competencies: IH 1.1 and 4.5.

Scenario 9.	S 9-1
------------------	-------

This scenario supports the following competencies: IH 1.2, 1.3, 2.1, 3.2, 4.5, and GTB 5.5.

Scenario 10	S 10-1
------------------	--------

This scenario supports the following competencies: IH 1.1, 1.3, 1.11, 4.3, and 4.5.

<i>Appendix A Training-to-Competency Matrix</i>	A-1
---	-----



1. Scope and Background

This study guide encompasses those competencies of the DOE Technical Qualification Program identified as the industrial hygiene topical area. This study guide supports one of DOE's commitments to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*. This study guide was produced in support of the lead site concept by the Ohio Field Office Training Division.

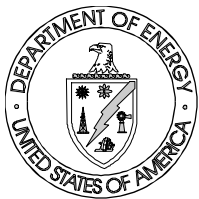
These industrial hygiene competencies can be attained and demonstrated by three methods: competency equivalency documented by previous training, education, and experience; competency evaluation of knowledge and skills using examinations, performance demonstrations, or evaluations; and competency exemption, which is a written release from the requirement to meet a specific competency. Some general examples of these methods include documentation of equivalent training or education, a test-out or challenge test, a requirement waiver, completion of applicable course work, and other learning activities such as this study guide.

2. Purpose

The purpose of this study guide is twofold:

- To identify the training content and associated self-study activities that will promote the learning of the skills and knowledge associated with the industrial hygiene competencies.
- To provide a matrix of existing comparable and applicable learning activities (such as training or education courses) and materials, which can then be used to satisfy the competency requirements.

NOTE: This guide is intended as a self-study activity for industrial hygiene professionals within the Department of Energy. The exercises are intended to stimulate reflective thinking, provide a means for the hygienist to investigate areas of possible weakness, and to reinforce learning activities. The exercises are not intended to provide an "examination" for hygienists, or to be used to determine their competence. A separate question bank that may be used to "test out" has been developed and is available.



3. References

The references in the Recommended Readings provided for each competency are recommendations only. They are not intended to provide the only acceptable references or all of the relevant references for a competency. They provide some direction toward references relevant to the competency or topic under discussion. An individual hygienist may or may not wish to pursue them, depending upon the hygienist's personal knowledge and experience with the topic and upon the reference's relevance to his/her work.

NOTE: DOE Orders listed below constitute guidance applicable at the time the Industrial Hygiene Qualification Standard was written. Many of the listed orders have since been canceled and superseded by other guidance. The user of this study guide is therefore advised of his/her responsibility to identify and obtain the currently applicable DOE guidance when DOE Orders are cited. It should be further understood that DOE industrial hygiene guidance at this printing is not yet complete and that additional Orders or guidance is planned. Therefore, wherever DOE O 440.1 is recommended as reading material, other guidance including the planned "DOE Industrial Hygiene Program Implementation Guide" should also be read or reviewed.

- a. 10 *Code of Federal Regulations* (CFR) 835, "Occupational Radiation Protection."
- b. 29 CFR 1910, "Occupational Safety and Health Standards."
- c. 29 CFR 1926, "Safety and Health Standards."
- d. 40 CFR 783, "Asbestos."
- e. American Conference of Governmental Industrial Hygienists (ACGIH) TLV Booklet, *American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*.
- f. ACGIH, *Industrial Ventilation: A Manual of Recommended Practice*.
- g. American Industrial Hygiene Association (AIHA), *Code of Ethics*.
- h. AIHA, *A Strategy for Exposure Assessment*.
- i. AIHA, *Engineering Field Reference*.
- j. ANSI C95.1, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz."



Introduction

- k. ANSI Z88.2, "Practices for Respiratory Protection."
- l. ANSI Z88.6, "Respiratory Protection, Respirator Use, and Physical Qualifications for Personnel."
- m. ANSI Z117.1, "Safety Requirements for Working in Tanks and Other Confined Spaces."
- n. ANSI Z136.1, "Safe Use of Lasers."
- o. DOE Guide 440.1-3, *Occupational Exposure Assessment* (Draft for Interim Use and Comment).
- p. DOE Order 210.1, *Performance Indicators and Analysis of Operations Information*.
- q. DOE Order 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*.
- r. DOE Order 3790.1B, *Federal Employee Occupational Safety and Health Program*.
- s. DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*.
- t. DOE Order 5480.1B, *Environment, Safety and Health Program for Department of Energy Operations*.
- u. DOE Order 5480.4, *Environmental Protection, Safety, and Health Standards*.
- v. DOE Order 5480.8A, *Contractor Occupational Medical Program*.
- w. DOE Order 5480.9A, *Construction Project Safety and Health Management*.
- x. DOE Order 5480.10, *Contractor Industrial Hygiene Program*.
- y. DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*.
- z. DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*.
- aa. DOE Order 5480.22, *Technical Safety Requirements*.
- ab. DOE Order 5480.23, *Nuclear Safety Analysis Reports*.
- ac. DOE Order 5481.1B, *Safety Analysis and Review System*.



- ad. DOE Order 5482.1B, *Environment, Safety, and Health Appraisal Program*.
- ae. DOE Order 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned, Contractor-Operated Facilities*.
- af. DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*.
- ag. DOE Order 5500.3A, *Planning and Preparedness for Operational Emergencies*.
- ah. DOE Notice 441.1, *Radiological Protection for DOE Activities*.
- ai. D. Jeff Burton, *Industrial Ventilation Work Book*, DJBA Inc.
- aj. Forsberg & Mansdorf (Van Nostrand Reinhold), *Quick Selection Guide to Chemical Protective Clothing*.
- ak. National Safety Council, *Fundamentals of Industrial Hygiene*.
- al. National Institute for Occupational Safety and Health (NIOSH), *Occupational Diseases: A Guide to Their Recognition*.
- am. Patty's *Industrial Hygiene and Toxicology*, Volumes 1 through 3, Clayton & Clayton.

4. DOE Orders in Transition

DOE Orders are in a state of transition. However, Order cancellation does not necessarily mean that the Order is no longer applicable to a site. For example, DOE N 441.1, *Radiological Protection for DOE Activities*, which cancels three radiation protection-related Orders, states:

“Cancellation of an Order does not, by itself, modify or otherwise affect any contractual obligation to comply with such an Order. Canceled Orders that are incorporated by reference in a contract shall remain in effect until the contract is modified to delete the reference to the requirements in the canceled Orders.”

This study guide refers to both the old and new Orders. There are three reasons for this: (1) as stated above, many facilities are contractually obligated to follow the old Orders, (2) the replacement process is dynamic and will continue for some time, and (3) the old Orders are often content-oriented and house the in-depth details regarding processes and procedures.



Introduction

Rather than publish a matrix of new and old Orders within this study guide, participants should refer to the document, *Crosswalk of Old Directives Numbers to New Directives Numbering System*. This is an excellent resource. It is linked to the DOE homepage (<http://apollo.osti.gov/>), “Clearinghouse for Training, Education and Development” (<http://cted.inel.gov/cted/>), or may be reached directly at the following gopher site:

`gopher://VM1.HQADMIN.DOE.GOV:70/00/doemenu1/directiv/251cross.asc`

NOTE: The study guides were developed to provide a timely route for incumbents to utilize existing materials. It is anticipated that they will be supplemented and/or replaced by other courses and more detailed materials as they are located or developed.

5. Internet Sites

The research and development for these study guides relied heavily upon the Internet. Many of the referenced materials are available by accessing World Wide Web sites supported by DOE and other organizations. The constantly evolving nature of the Internet makes it impossible to guarantee the continued existence of any referenced site, but some of the more helpful sites have been included here.

- **American Board of International Hygiene-** <http://chppm-www.apgea.army.mil/Armyih/abih.htm>
- **American Industrial Hygiene Association-** <http://www.aiha.org>
- **American National Standards Institute-** <http://www.ansi.org>
- **Army IH Program Home Page-** <http://chppm-www.apgea.army.mil/Armyih>
- **Department of Energy (DOE) Home Page-** <http://www.doe.gov>
- **DOE Clearinghouse for Training, Education and Development Home Page** <http://cted.inel.gov/cted>
- **DOE Course Index -** <http://cted.inel.gov/cted/trainidx.html>
- **DOE ES&H Technical Information Services (TIS)-** <http://tis.eh.doe.gov>
- **DOE Office of Training and HRD, EH Training Material Page-** http://cted.inel.gov/cted/eh_mat.html
- **DOE OpenNet Database -** <http://apollo.osti.gov/html/osti/opennet/opennet1.html>
- **FedWorld Home Page -** <http://www.fedworld.gov>
- **National Institute for Occupational Safety and Health (NIOSH) Home Page-** <http://www.cdc.gov/niosh/homepage.html>
- **Occupational Safety & Health Administration (OSHA)-** <http://www.osha.gov>
- **Pro-Am Safety Links - Professional Organizations -** <http://www.pro-am.com/safelink/profess.htm>
- **USDOL OSHA OCIS Home Page-** <http://www.osha-slc.gov>
- **U.S. House of Representatives- Code of Federal Regulations -** <http://www.house.gov>



6. How to Use This Study Guide

- a. Read this guide and complete the associated learning activities for those competencies you wish to satisfy through self-study.
- b. For assistance or additional information, contact your supervisor or subject matter experts at your facility or site, or refer to identified resources in the Training Matrix, located in Appendix A.